

University of Dundee

Joint effects of intensity and duration of cigarette smoking on the risk of head and neck cancer

Di Credico, Gioia; Edefonti, Valeria; Polesel, Jerry; Pauli, Francesco; Torelli, Nicola; Serraino, Diego

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Table 1 - Distribution of cases of oral and pharyngeal cancer, laryngeal cancer, and controls according to selected variables. INHANCE consortium

	Controls	(%)	Oral and pharyngeal cancer cases	(%)	Laryngeal cancer cases	(%)
	29,844		13,317		4,943	
Sex^a						
Female	9,599	(32)	3,786	(28)	730	(15)
Male	20,245	(68)	9,531	(72)	4,213	(85)
Age (years)^a						
<40	2,063	(7)	708	(5)	94	(2)
40 to 44	2,045	(7)	823	(6)	207	(4)
45 to 49	3,018	(10)	1,692	(13)	471	(10)
50 to 54	4,231	(14)	2,321	(17)	787	(16)
55 to 59	5,044	(17)	2,627	(20)	1,025	(21)
60 to 64	4,726	(16)	2,185	(16)	1,011	(20)
65 to 69	4,181	(14)	1,489	(11)	754	(15)
70 to 74	3,044	(10)	922	(7)	413	(8)
≥75	1,492	(5)	550	(4)	181	(4)
Race^a						
White	21,462	(72)	9,076	(68)	3,627	(73)
Black	976	(3)	683	(5)	169	(3)
Hispanic	421	(1)	149	(1)	41	(1)
Asian and Pacific Islanders	3,849	(13)	1,293	(10)	77	(2)
Others and Brazilians	3,136	(11)	2,116	(16)	1,029	(21)
Study						
Aviano	802	(3)	288	(2)	128	(3)
Baltimore	163	(1)	123	(1)	29	(1)
Beijing	377	(1)	322	(2)	0	(0)
Boston	473	(2)	339	(3)	75	(2)
Buffalo	863	(3)	282	(2)	113	(2)
Central Europe	730	(2)	238	(2)	295	(6)
France Multicen. (1989-1991)	255	(1)	163	(1)	247	(5)
France Multicen. (2001-2007)	2,964	(10)	1,343	(10)	366	(7)
Germany-Heidelberg	644	(2)	0	(0)	172	(3)
Germany-Saarland	83	(0)	53	(0)	22	(0)
HOTSPOT	59	(0)	63	(0)	0	(0)
Houston	738	(2)	561	(4)	119	(2)
International Multicenter	1,450	(5)	1,053	(8)	0	(0)
Iowa	600	(2)	344	(3)	58	(1)
Italy Multicenter	2,506	(8)	685	(5)	421	(9)
Japan (2001-2005)	2,817	(9)	392	(3)	71	(1)
Latin America	1,446	(5)	981	(7)	612	(12)
Los Angeles	905	(3)	273	(2)	70	(1)
Milan (1984-1989)	1,413	(5)	161	(1)	215	(4)
Milan (2006-2009)	669	(2)	118	(1)	162	(3)

MSKCC	115	(0)	61	(0)	20	(0)
New York Multicenter	1,246	(4)	818	(6)	202	(4)
North Carolina (1994-1997)	154	(1)	91	(1)	31	(1)
North Carolina (2002-2006)	982	(3)	594	(4)	283	(6)
Puerto Rico	410	(1)	182	(1)	0	(0)
Rome	350	(1)	98	(1)	173	(3)
Sao Paulo	1,519	(5)	1,042	(8)	406	(8)
Seattle (1985-1995)	465	(2)	317	(2)	0	(0)
Seattle-Leo	371	(1)	264	(2)	123	(2)
Switzerland	824	(3)	311	(2)	104	(2)
Tampa	789	(3)	115	(1)	48	(1)
US Multicenter	936	(3)	710	(5)	0	(0)
Western Europe	1,726	(6)	932	(7)	378	(8)
Education^a						
No education	1,078	(4)	726	(5)	118	(2)
≤Junior high school	10,456	(35)	4,674	(35)	2,371	(48)
Some high school	5,330	(18)	2,751	(21)	922	(19)
High school graduate	3,883	(13)	1,883	(14)	717	(14)
Technical school, some college	4,825	(16)	1,989	(15)	496	(10)
≥College graduate	4,272	(14)	1,294	(10)	319	(6)
Drinking status						
Never user	8,068	(27)	2,279	(17)	578	(12)
Former user	3,072	(10)	2,521	(19)	833	(17)
Current user	14,210	(48)	6,943	(52)	2,442	(49)
Missing	4,494	(15)	1,574	(12)	1,091	(22)
Alcohol drinking intensity (number of drinks/day)						
0-<1	17,207	58)	4,899	37)	1,433	(29)
1-<5	8,913	30)	4,099	31)	1,757	(35)
≥5	2,925	10)	3,814	29)	1,626	(33)
Missing	799	3)	505	4)	127	(3)
Alcohol duration (years)						
Never drinkers	8,068	(27)	2,279	(17)	578	(12)
0-<20	2,984	(10)	1,182	(9)	297	(6)
20-<40	9,427	(32)	5,422	(41)	1,848	(37)
40-<60	6,013	(20)	2,920	(22)	1,435	(29)
≥60	412	(1)	176	(1)	123	(2)
Missing	2,940	(10)	1,338	(10)	662	(13)

ABBREVIATIONS: MSKCC: Memorial Sloan Kettering Cancer Center.

^a We excluded subjects with missing information on age, sex, and race (see Figure 1). Missing values for education were imputed according to the INHANCE protocol.¹¹

Table 2 - Distribution of cases of oral and pharyngeal cancer, laryngeal cancer, and controls according to selected aspects of cigarette smoking habits. INHANCE consortium

	Controls	(%)	Oral and pharyngeal cancer cases	(%)	Laryngeal cancer cases	(%)
Cigarette smoking status						
Never user	13,347	(45)	2,791	(21)	330	(7)
Former user	8,792	(29)	2,909	(22)	1,353	(27)
Current user	7,705	(26)	7,617	(57)	3,260	(66)
Cigarette smoking intensity (number of cigarettes/day)						
Never user	13,347	(45)	2,791	(21)	330	(7)
≥1-15	7,199	(24)	2,814	(21)	1,054	(21)
>15-25	6,166	(21)	4,483	(34)	2,083	(42)
>26-40	3,132	(10)	3,229	(24)	1,476	(30)
Cigarette smoking duration (years)						
Never user	13,347	(45)	2,791	(21)	330	(7)
≥1-25	7,214	(24)	2,019	(15)	604	(12)
>25-35	4,360	(15)	3,370	(25)	1,330	(27)
>35-51	4,923	(16)	5,137	(39)	2,679	(54)
Time since quitting cigarette smoking (years) (for formers only)^a						
≥1-<10	2,300	(26)	1,310	(45)	626	(46)
≥10	3,655	(72)	1,522	(52)	711	(53)
Missing	137	(2)	77	(3)	16	(1)

^a Proportions were calculated among former smokers only.

Table 3 - Odds ratios (ORs)^a and 95% credible intervals (CIs) of oral and pharyngeal cancer and laryngeal cancer in current smokers, for the joint effect of intensity (cigarettes/day) and duration (years) of cigarette smoking estimated through step-function as compared with results from bivariate spline models. INHANCE consortium

		Intensity (cigarettes/day)					
Cancer type		1-15		16-25		26-40	
		Ca:Co	OR (95%CI) [Min-Max] ^b	Ca:Co	OR (95%CI) [Min-Max] ^b	Ca:Co	OR (95%CI) [Min-Max] ^b
Oral cavity and pharynx							
	Duration (years)						
	1-25	322:1,046	1.5 (1.4-1.7) [0.9-3.1]	371:663	2.7 (2.4-2.9) [0.9-4.2]	191:270	3.3 (2.8-3.9) [0.8-5.9]
	26-35	583:911	2.9 (2.7-3.1) [1.4-4.8]	1,138:954	5.1 (4.9-5.4) [3.5-6.9]	849:466	7.2 (6.7-7.8) [4.6-11.0]
	36-51	912:1,175	3.7 (3.5-3.9) [1.6-5.8]	1,838:1,409	6.0 (5.8-6.2) [5.2-7.1]	1,413:694	8.4 (8.0-8.9) [7.1-10.6]
Larynx							
	Duration (years)						
	1-25	75:908	3.8 (3.3-4.4) [1.1-8.8]	112:576	9.4 (8.3-10.5) [2.3-20.1]	70:247	14.8 (12.2-17.8) [2.8-23.1]
	26-35	183:812	7.3 (6.9-7.9) [2.9-12.6]	423:845	17.2 (16.8-17.6) [10.1-29.6]	319:415	28.5 (27-30.2) [22.4-37.7]
	36-51	394:1,064	8.9 (8.8-9.1) [3.9-15.3]	966:1,274	19.5 (19.3-19.8) [13.9-31.0]	718:616	33.9 (33.5-34.3) [30.9-43.2]

^a Fitted models included adjustment for age, sex, race, study, education, drinking status, drinking intensity, and drinking duration. The reference category was defined as “Never smokers”. The reference category included 2,791 cases and 13,139 controls for the analysis on oral and pharyngeal cancer and 330 cases and 11,433 controls for that on laryngeal cancer.

^b Min and Max represent the lowest and the highest OR values estimated for any combinations of intensity and duration by bivariate spline models.